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Spin wave anomalies in the ferromagnetic and insulating state of $\mathbf{La_{1-x}Ca_xMnO_3}$

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In the phase diagram of $La_{1-x}Ca_xMnO_3$, an intringuing ferromagnetic and insulating phase is observed at the approach of the metal-insulator transition ,located at x≈0.22. In this x range (0.125≥x≥0.22), the spin wave dispersion is very anomalous. Instead of being continuous throughout the Brillouin zone, the dispersion appears broken into three curves. Comparison with the dispersion of the phonon modes strongly suggests that phonon-magnon coupling is responsible for such anomalies.